Hashing 2

Friday, February 2, 2018 1:12 PM

$\theta \to$ abbaa abbb

$k=2 \to$ bbabba

$\boxed{\text{hash}(\text{abbb}) \bmod 2 = 0}$

K

abcab

$k=2$

abdcb $k=2$

$\boxed{\text{abcab} \bmod 2 = 1}$

$k=3$

$\boxed{\forall s \in \{a,b\}^* \; \text{hash}(s) \bmod k = 0}$

8 10 points in a 2D plane.

How many of points that lie on the same line.

Eq of line $\to$ $y - y_1 = m(x - x_1)$

slope

$\boxed{(y_2 - y_1) = m(x_2 - x_1)}$

$\boxed{y_2 - y_1 - m x_2 + m x_1 = 0}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

y-intercept $(x=0)$

3 points

For every pair of points $\to$ form line

check hash

$O(n^2)$

$O(n)$

$O(n^2)$

f_1 f_2

$y = mx + c$

$y_1 = \left(\dfrac{y_2 - y_1}{x_2 - x_1}\right) x_1 + c$

$\Rightarrow y_1 = \dfrac{(y_2 - y_1)}{(x_2 - x_1)} x_1 + c$

(x_1, y_1)

(x_2, y_2)

$\Rightarrow y_2 x_1 - y_1 x_1 - x_2 y_1 + x_1 y_1 = c$

$(x_2 - x_1)$

$\Rightarrow \boxed{c = \dfrac{y_2 x_1 - y_1 x_1}{(x_2 - x_1)}}$

key $\frac{x_1}{x_2}$ value key $\frac{y_2 - y_1}{x_2 - x_1}$

(y_1, y_2) (y_2, y_3) (y_3, y_1)

$\{(y_1, y_2), (y_2, y_3)\} \to c = 1 \quad c = 2$

key $\frac{x_1}{x_2}$ value key $\frac{y_2 - y_1}{x_2 - x_1}$

$\{(y_1, y_2), (y_1, y_3)\} \to m = 0, \; c = 2$

$\{(y_1, y_1), (y_1, y_3)\} \to m = 1, \; c = 2$

$\boxed{\{(y_1, y_2), (y_1, y_3)\}}$

$\boxed{m = 0, \; c = 2}$

$\boxed{m = 1, \; c = 2}$

$\boxed{(y_1, y_2) \quad (y_1, y_3)}$

$\boxed{m = 0, \; c = 2}$

$c = y_1 + y_2$

$\boxed{m = 1, \; c = 2}$

points on a line

f_1 f_2 f_3 f_4 f_5

$\boxed{y_1, y_2}$

$\boxed{y_1, y_3}$

$\boxed{y_1, y_4}$

$\boxed{y_1, y_5}$

$\boxed{y_2, y_3}$

$\boxed{y_2, y_4}$

$\boxed{y_2, y_5}$

$\boxed{y_3, y_4}$

$\boxed{y_3, y_5}$

$\boxed{y_4, y_5}$

$\boxed{\dfrac{y(x_1 - y_1)}{x_2 - y_2}}$

$\Rightarrow n^2 - n = 2f$

$\Rightarrow n^2 - n - 2f = 0$

$ax^2 + bx + c = 0$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\boxed{n = \dfrac{1 + \sqrt{1 + 8f}}{2}}$

$\boxed{n = \dfrac{1 + \sqrt{1 + 8f}}{2}}$

$O(n^2)$

$O(n^2)$

$m = \dfrac{(y_2 - y_1)}{(x_2 - x_1)}$

$\boxed{d = y_1 - (y_2 - y_1)(x_2 - x_1)}$

key $\frac{y}{x}$ $\frac{3}{1}$ $\frac{6}{2}$

$\langle 1, 3 \rangle$ $\langle 2, 6 \rangle$

$\langle 2, 1 \rangle$ $\langle 4, 2 \rangle$

$\langle 3, 1 \rangle$ $\langle 6, 2 \rangle$

key $\to \langle m_1, c \rangle$

$\boxed{\dfrac{(y_2 - y_1)}{x_2 - x_1}, \dfrac{(x_2 - x_1)}{x_2 - x_1}}$

$\boxed{\dfrac{(y_1 - x_1 y_2)}{x_2 - x_1}}$

$\dfrac{1}{1} = 1$

$\dfrac{1}{1} = 1$

$O(n^2)$

space $= O(n^2)$

$\boxed{\langle m_1, c \rangle}$

f_1 f_2

(x_1, y_1)

(x_2, y_2)

$\boxed{(x_1, y_1) \quad (x_2, y_2) \to m_1}$

$\boxed{(x_1, y_1) \quad (x_3, y_3) \to m_2}$

$\boxed{(x_1, y_1) \quad (x_4, y_4) \to m_3}$

$\boxed{(x_1, y_1) \quad (x_5, y_5) \to m_4}$

$\boxed{(x_2, y_2) \quad (x_3, y_3) \to m_5}$

$\boxed{(x_2, y_2) \quad (x_4, y_4) \to m_6}$

$\boxed{(x_2, y_2) \quad (x_5, y_5) \to m_7}$

$\boxed{(x_3, y_3) \quad (x_4, y_4) \to m_8}$

$\boxed{(x_3, y_3) \quad (x_5, y_5) \to m_9}$

$\boxed{(x_4, y_4) \quad (x_5, y_5) \to m_{10}}$

$\boxed{\langle m, c \rangle}$

$\boxed{\langle m, c \rangle}$

$\boxed{\langle m, c \rangle